FY2013 ANNUAL REPORT OF HATCHERY EVALUATION ACTIVITIES FOR SPRING CHINOOK SALMON AT DWORSHAK AND KOOSKIA NATIONAL FISH HATCHERIES

Brood Year 2011 Smolt Releases
Brood Year 2012 Marking and Tagging/Parr Releases
Brood Year 2013 Adult Returns
Brood Year 2008 SAR
Prediction for 2014 Adult Returns

Prepared by:

John Hook, Ray N. Jones, Carrie Bretz, and Chris Peery
Fish Biologists

Idaho Fishery Resource Office
Dworshak Fishery Complex
U.S. Fish and Wildlife Service
276 Dworshak Complex Drive
Orofino, Idaho 83544

Prepared for:

Complex Manager
Dworshak Fisheries Complex
U.S. Fish and Wildlife Service
276 Dworshak Complex Drive
Orofino, Idaho 83544

And

Lower Snake River Compensation Plan Program
U.S. Fish and Wildlife Service
Boise, Idaho 83709

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DISCLAIMER

Data in this report is as complete and accurate as possible at the time of printing. However, because of the life history complexity of spring Chinook salmon and the mixed stock fisheries in the Clearwater River, data is provisional and subject to future revision and corrections, especially in regards to the adult returns to the rack and harvest. All questions about the validity or precision of information in this report should be directed to the Idaho Fishery Resource Office, Dworshak Fisheries Complex, U.S. Fish and Wildlife Service, (208)-476-7242.

Note: Analysis of adult returns is incomplete. The 3-Ocean adult returns in 2013 complete all the adults returning for BY08, released as smolts in 2010. However, until all the coded-wire tags recovered in various fisheries throughout the Columbia, Snake, and Clearwater rivers are reported and recorded in the PSMFC RMIS database, a final accounting cannot be completed. The final accounting will be available after the completion of the BY08 Brood Year Report in FY2015.

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INTRODUCTION

Dworshak National Fish Hatchery (NFH) is located at the confluence of the North Fork and the main stem Clearwater River near Ahsahka, Idaho. Construction of the hatchery was included in the authorization for Dworshak Dam and Reservoir (Public Law 87-847, October 23, 1962) to mitigate for losses of steelhead (*Oncorhynchus mykiss*) caused by the dam and reservoir. The hatchery was designed and constructed by the U.S. Army Corps of Engineers and has been administered and operated by the U.S. Fish and Wildlife Service since the first phase of construction was completed in 1969. In 1982, thirty 8-ft by 80-ft raceways were constructed under the Lower Snake River Compensation Plan (LSRCP) to provide rearing facilities for spring Chinook salmon (*O. tshawytscha*).

The mitigation goal for the program calls for the return of 9,135 adults above Lower Granite Dam annually after 36,540 adults have been harvested downstream of Lower Granite Dam in the lower Columbia and Snake rivers. The original production program designed to meet the mitigation goal was based on releasing 1.4 million smolts at a size of 20 fish per pound annually, assuming a smolt-to-adult return rate of 0.87%. In the early 1990's, based on results of a rearing density evaluation project (Jones and Miller 1996), the number of smolts released was reduced to 1.05 million at a size of 15 fish per pound. In 2010, flows in the raceways were increased as a result of adjustments being made to reduce high levels of dissolved gases. With the increased flows, rearing capacity in terms of Flow Index was increased allowing the normal rearing profile of 35,000 fish per raceway (1.05 million total release) to be increased to 45,000 fish per raceway (1.35 million total release). Currently, an evaluation project is being conducted to increase rearing density, resulting in a smolt release to 1.65 million annually for the next three years (Dworshak Complex Hatchery Evaluation Team 2011).

Kooskia NFH is located about 1.5 miles east of Kooskia, Idaho, 0.5 miles upstream of the confluence of Clear Creek and the Middle Fork Clearwater River. In 1978, Kooskia NFH was included as part of the Dworshak Fishery Complex. The production program at Kooskia NFH is a U.S. Fish and Wildlife Service hatchery constructed to mitigate for water development programs in the Columbia River basin. Currently, the program calls for the release of 800,000 spring Chinook salmon smolts annually to provide sport and Tribal harvest opportunities in the Clearwater River. Because of production constraints, temperature considerations, and other factors, Kooskia NFH brood stock are held and spawned at Dworshak NFH. Dworshak NFH provides initial incubation of eggs for Kooskia NFH until the eye-up stage at which point they are enumerated and transported to Kooskia NFH for final rearing.

This report includes the stock origin and history of the programs, the smolts releases and emigration performances for Brood Year 2011, marking and tagging for Brood Year 2012, and the age composition of the rack returns, estimates of the sport and Tribal harvest, and estimates of the total adult return to the Clearwater River for Brood Year 2013. The smolt to adult survival for Brood Year 2008 at each hatchery is estimated. The predictions made for the 2013 adult return to each hatchery are reviewed and pre-season predictions for the adult returns to each hatchery in 2014 are presented.

BROOD STOCK ORIGIN AND HISTORY

Over the years, the spring Chinook salmon artificial production program in the Clearwater River Basin has expanded significantly to include four major federal, state, and Tribal hatcheries, several satellite facilities, and a number of off-site acclimation and release locations. In 2011, the coded-wire tags recovered from spring Chinook salmon broodstock at Dworshak and Kooskia NFHs indicated a noticeable degree of straying from these other locations into both of these hatcheries. Strays cannot be identified as such based on external markings and are determined only after the fish have been spawned and the coded-wire tags have been recovered and read. Thus, the broodstock for Dworshak and Kooskia NFHs incorporates adults from other programs in the Clearwater Basin and these percentages are reported in the "*Stock Composition* **- Rack Return"** sections for these hatcheries in the **2013 Adults Returns** section of this report. However, for purposes of broodstock history, all the adults returning to Dworshak and Kooskia NFHs, including strays from other Clearwater River programs, are considered stock for that hatchery (Clearwater River Stock). **Table 1** will only reflect changes in brood stock composition resulting from out-of-basin transfers from other hatcheries in situations where broodstock shortages cannot be met from within the Clearwater River Basin.

Dworshak NFH

The Dworshak NFH spring Chinook salmon program was started using spring Chinook salmon stock from the Leavenworth and Little White Salmon NFH programs. Eggs were transferred from these facilities to Dworshak NFH and made up the smolt releases from 1983 to 1986 (**Table 1**). Since these stocks were very strongly influenced by transfers from Carson NFH to Leavenworth and Little White Salmon NFHs, the early Dworshak spring Chinook salmon stock was considered a Lower Columbia River derivative. The spring Chinook salmon program for brood years 1985 and 1986 consisted entirely of eggs that had been transferred from Rapid River State Fish Hatchery (SFH). Rapid River State Fish Hatchery used spring Chinook salmon trapped at Hells Canyon Dam (considered an upper Snake River stock) as an original parent stock. Thus, smolts released from Dworshak NFH in 1987 and 1988 were entirely Rapid River stock, shifting the program away from using the Lower Columbia River Chinook stock. In the 25 years since 1988, Dworshak NFH has maintained its program from fish that have returned directly to the North Fork Clearwater River, with the exception of two years when the program was below full production. In 1995, releases from Dworshak NFH were one third Kooskia stock spring Chinook salmon. Then in 2001 about one third of the Dworshak release was Rapid River stock (Lookingglass Fish Hatchery adults collected at Lower Granite Dam). The recent returns to Dworshak NFH (1989 and later) were referred to as Dworshak stock, since they are progeny of returns to Dworshak NFH, rather than direct products of transfers of Rapid River stock. However, since 2012, progeny from those spawned at Dworshak are no longer considered unique to Dworshak NFH and are considered Clearwater River stock, since the broodstock is known to include adults from the other hatchery programs in the Clearwater Basin that stray into the Dworshak NFH ladder.

Table 1. Brood stock history of Dworshak NFH spring Chinook salmon smolts directly released from the hatchery, 1983-2013. (RR = Rapid River, KK = Kooskia, DW = Dworshak, LE = Leavenworth, LW = Little White Salmon, CW = Clearwater River).

Release Year	Brood Stock Composition
1983	75% LW, 12% RR, 13% LE
1984	100% LE
1985	68% LW, 32% LE
1986	100% LE
1987 – 1988	100% RR
1989 – 1994	100% DW
1995	66% DW, 34% KK
1996 – 2000	100% DW
2001	64% DW, 36% RR
2002-2013	100% CW

Kooskia NFH

The Kooskia NFH spring Chinook salmon program was started using a wide variety of stocks from the Lower Columbia River and Rapid River SFH. However, from 1973 through 1980, smolt releases had a predominant Lower Columbia River stock influence. Egg transfers of Lower Columbia River stock from Dworshak NFH in 1985 and 1986 resulted in smolt releases in 1987 and 1988 that were a mixed stock, referred to as Clearwater stock (**Table 2**). Since the Kooskia NFH program already had stock made up primarily of Lower Columbia River derivatives, the resultant program (1989 and later) retained that lineage, but was referred to as Kooskia stock. Length frequency data, ocean age class at return, and allele frequencies (Elliot and Pascho 1994) all supported a distinction between Dworshak and Kooskia stocks.

In 2009, the Co-Managers agreed to implement a change in brood stock management at Kooskia NFH. Rather than use only Kooskia stock for brood stock, the decision was made to not discriminate between different stocks that return to Kooskia NFH when selecting fish for brood stock. Thus, adults returning from releases made in 2008, 2009, and 2010 by the Idaho Department of Fish and Game using stock originally released at their Powell satellite facility, would be included into the brood stock for spawning in the future. Starting with the progeny of brood stock collected and spawned in 2010, the resultant progeny released in 2012 and all subsequent smolt releases will be referred to as Clearwater River stock (CW). Those adults identified as having been naturally spawned in Clear Creek, or as part of the Idaho Salmon Supplementation (ISS) program (Bowles and Leitzinger 1991), will be released above the weir to spawn naturally.

Table 2. Brood stock history of Kooskia NFH spring Chinook salmon smolts directly released from the hatchery, 1971-2012. (RR = Rapid River, KK = Kooskia, LE = Leavenworth, SS = South Santiam, CW = Clearwater River, LW = Little White Salmon, CA = Carson, WR = Wind River, SF=South Fork Clearwater, P=Powell[1]).

Release Year	Brood Stock Composition
1971	86% RR,14% WR
1972	100% RR
1973 – 1974	100% CA
1975	58% RR, 42% CA
1976	100% SS
1977	84% CA, 11% KK, 5% LW
1978	75% RR, 25% CA
1979	69% KK, 31% CA
1980	31% KK, 69% CA
1981	64% CA, 19% KK, 17% RR
1982	100% CA
1983	65% KK, 35% LE
1984	89% KK, 11% RR
1985 – 1986	100% KK
1987 – 1988	100% CW
1989 – 2006	100% KK
2007	69% KK, 31% DW
2008	100%KK
2009	62%KK, 15% DW, 23% P
2010	73%KK , 15 %P, 12% SF
2011	72%KK, 28% P
2012 – 2013	100% CW

[1] Powell stock are progeny from the IDFG LSRCP Program located on Walton Creek in the Lochsa River, a tributary of the Clearwater River.

BROOD YEAR 2011 SMOLT RELEASES

Brood Year 2011 was established with the adult returns to Dworshak and Kooskia NFHs in 2011 (Dworshak National Fish Hatchery 2011). Incubation and early rearing was completed in late spring 2012. Juveniles were coded-wire tagged for evaluation of adult contributions and were re-stocked into raceways at final rearing densities in August, 2012. Final rearing was completed during the winter of 2012/2013 and representative groups were marked with PIT tags in 2013 to monitor smolt survival and travel time from the hatchery to Bonneville Dam. Smolt releases were completed in the early spring of 2013.

Size at Release

Hatchery rearing strategies have target weights for smolts prior to release to optimize fish density within raceways and smolt survival after release. Many factors can influence size at release such as water temperature, fish diet and various fish health issues. Release strategies for spring Chinook salmon reared at Dworshak NFH have a target weight of about 20 fish per pound (fpp), with a five year size-at-release average of 19.5 fpp. Dworshak NFH maintains an average water temperature of 45° F in the outside spring Chinook salmon rearing raceways throughout the rearing cycle. Kooskia NFH also has a target goal of 20 fpp. Unlike Dworshak NFH, Kooskia NFH experiences winter icing in their burrows ponds and raceways. These colder temperatures severely limit growth over the winter months. Therefore, Kooskia NFH has a five year size-at-release average of 27.1 fpp. At the time of release, Dworshak NFH smolts averaged 22.6 fpp and 134 mm in length (5.3 inches). Kooskia NFH smolts averaged 20.6 fpp and 5.5 inches (139.7 mm) in total length.

Release Numbers and Timing

Mean daily flows in the Clearwater River and into Lower Granite Reservoir are monitored starting the first of March in order to time spring Chinook salmon smolt releases with increasing flows. Releases are targeted between the last week of March and the first two weeks in April. The Idaho FRO began monitoring flows and river conditions starting March 1, providing weekly updates. By March 27, the mean daily inflow into Lower Granite Reservoir and the mean daily flow of the main stem Clearwater River at the Orofino Bridge were below the 10-year averages. However, the Army Corps of Engineers had planned an increase in the daily discharge from Dworshak Dam to 5,000 cfs on April 1 and increased the discharge to 10,000 cfs on April 2, creating good emigration conditions for releasing smolts into the Clearwater River. Even so, conditions in the Snake River above Lower Granite Dam were not expected to improve significantly during the first part of April creating less than desirable emigration conditions compared to past years. Based on the need to perform maintenance on the B Bank raceways, the FRO recommended April 1 and 2, 2013 as release dates. Dworshak NFH released a total of 1,377,508 BY11 spring Chinook salmon smolts during the evenings of April 1st and 2nd.

A total of 341,740 (22 fpp) spring Chinook salmon smolts were released from Kooskia NFH into Clear Creek on March 15th to create space to acclimate the Idaho Department of Fish and Game Powell stock spring Chinook salmon from Clearwater Hatchery prior to release into Clear Creek. The remaining 343,069 (20 fpp) were released into Clear Creek on March 29th, making the total release 684,809 Chinook salmon. Burrows ponds at that time were supplied water from Clear Creek which had an average water temperature of 40 degrees F.

The Idaho Department of Fish and Game released 234,511 Powell stock spring Chinook salmon into Clear Creek on March 22, 2012 as part of their LSRCP plan program. Adults returning to Clear Creek from this release will be incorporated into the Kooskia NFH broodstock program. All the fish were marked by removing the adipose fin. A total of 119,266 were marked with adipose (AD) fin clip only and were 14 fpp averaging 157 mm fork length; 115,245 were tagged with code-wire and AD clip and were 17.2 fpp averaging 147 mm fork length. A total of 17,078 were tagged with PIT tags.

These fish will return to their respective release locations in 2014, 2015, and 2016 as 1-, 2-, and 3-Ocean adults, respectively.

Emigration Performance and Survival

PIT-tags are used to help evaluate the effectiveness of the production programs at both Dworshak and Kooskia NFH. Information is collected at the various dams throughout the lower Snake and Columbia rivers and is used to provide estimates on emigration time and survival. PIT-tags also provide real-time data on adult return timing and a means to assess total return as fish are detected at Columbia and Snake River dams.

Dworshak NFH - A total of 51,803 pit-tagged smolts were released at Dworshak NFH as part of the Comparative Survival Study being conducted by the Fish Passage Center. The Comparative Survival Study evaluates the effectiveness of transporting smolts past the Snake and Columbia River dams as opposed to migration through the hydro system.

The migration time of smolts released from Dworshak NFH to Lower Granite Dam ranged from 4 days to 67 days with a harmonic mean travel time of 26 (SE=0.1981) days. Ten percent arrived at Lower Granite Dam within 18 days; 50% and 90% arrived within 38 days and 67 days, respectively. Smolts that migrated through the hydro system arrived at Bonneville Dam on average 42 (SE=0.13) days after release. Survival probabilities through the FCRPS were calculated using SURvival under Proportional Hazards 2.1 (SURPH) (Lady *et al.* 2001). The estimated survival for BY11 spring Chinook smolts to Lower Granite Dam was 79.8% (SE=0.0144). The overall estimated survival to Bonneville Dam was 59.0% (SE=0.0309).

Kooskia NFH - A total of 14,237 PIT-tagged smolts were released as part of the Hatchery Evaluation Program at Kooskia NFH. The migration time of smolts released from Kooskia NFH to Lower Granite Dam ranged from 8 days to 76 days with a harmonic mean travel time of 16 (SE=11.94) days. Ten percent arrived at Lower Granite Dam within 15 days; 50% and 90% arrived within 25 days and 50 days, respectively. Smolts that migrated through the hydro system arrived at Bonneville Dam on average 27 (SE=1.56) days after release. Survival probabilities through the FCRPS were calculated using SURvival under Proportional Hazards 2.1 (SURPH) (Lady *et al*. 2001). The estimated survival for BY11 spring Chinook smolts to Lower Granite Dam was 61.6% (SE=0.0150). The overall estimated survival to Bonneville Dam was 34.8% (SE=0.0378).

Adult Contribution and Survival

Coded-wire tags are used to estimate the contribution of adults to various commercial, sport and Tribal fisheries in the ocean, in the lower Columbia River, in the lower Snake River, and in the Clearwater River when they return as adults. Coded-wire tag groups are also used to represent

treatment and control groups for both on- and off-station research projects and provide information on the effectiveness of alternative production methods.

Unlike previous years, coded wire tag retention rates for Dworshak spring Chinook were checked 30 days post-tagging on October 1, 2012. The change in protocol resulted from the need to backfill ponds containing coded wire tagged fish with non-coded-wire tagged fish in order to increase fish density in each raceway. Increased densities were required to accommodate the Nez Perce Tribe Coho Program rearing of coho in six raceways, decreasing the number of raceways available for Chinook salmon rearing. The coded wire tag retention rates for Dworshak NFH BY11 spring Chinook smolts ranged from 97.0% to 100.00%. The coded-wire tag retention rate for Kooskia NFH BY11 spring Chinook smolts was 96.6% after 30 days. **Table 3** lists the tag codes, the number tagged, the estimated number of non-CWT fish each code represents at each hatchery, and the estimated mark rate.

Table 3. Coded-wire tag (CWT) release information for Brood Year 2011 spring Chinook salmon scheduled for release from Dworshak and Kooskia NFHs in 2013.

Hatchery	Tag Code	Number CWT Released	Total Number of Fish Released	Mark Rate[1]	Purpose
DNFH	053571	58,311	643,975	0.09	Contribution, Raceways B28and B30
	055088	58,976	400,015	0.16	Contribution, Raceway A4 and A6
KNFH	055068	96,926	684,809	0.14	Contribution, BP3
IDFG	100237	97,255	97,779		Contribution
	105871	20,808	20,948		Contribution
	No Wire		259,356	0.31	

[1] Number CWT Released divided by Total Number of Fish Released.

BROOD YEAR 2012 MARKING AND TAGGING/PARR RELEASES

Brood Year 2012 was established with the adult returns to Dworshak and Kooskia NFHs in 2012 (Dworshak National Fish Hatchery 2012). Incubation, early rearing and coded-wire tagging was completed in 2013. Coded wire tag retention rates for Dworshak NFH spring Chinook were checked 30 days post-tagging on September 23, 2013. The coded wire tag retention rates for Dworshak NFH BY12 spring Chinook smolts were 99%. Retention rates were sampled from a single raceway containing only coded wire tagged smolts. The retention rate was assumed to be the same for the remaining raceways, which were composed of both coded wire tagged and untagged smolts. **Table 4** lists the tag codes, the number tagged, the estimated number of unmarked fish each code represents at each hatchery, and the estimated mark rate. Brood Year 2012 will be released in the spring of 2014 and the final release numbers will be reported in the 2014 annual report.

Selway Parr Releases

As part of Nez Perce Tribe's fish production program, 285,433 BY2012 spring Chinook salmon parr were released into the Selway River on September 16 and 18, 2013 at a size of 101 fish per pound.

Table 4. Coded-wire tagging information for Brood Year 2012 spring Chinook salmon scheduled for release from Dworshak and Kooskia NFHs in 2014.

Hatchery	Tag Code	Number CWT	Estimated Number of Fish to be Released	Mark Rate[1]	Purpose
DNFH	055087	60,147	652,842	0.09	Contribution, Raceways A2 and A13
	055591	60,074	776,525	0.08	Contribution, Raceways B18, B19, B23, B26, B28
KNFH	055590	100,038	631,739	0.16	Contribution, BP 5

[1] Mark rate is calculated by dividing the number of CWTs by the Estimated Number of Fish to be Released.

BROOD YEAR 2013 ADULT RETURNS

The brood year is formed from the adults that return as brood stock to Dworshak and Kooskia NFHs during the 2013 return year. In this section, we present information on the pre-season adult return monitoring and run assessment, the hatchery returns, the sport and Tribal harvests for each stock, and an estimate of the total adults returning to the Clearwater River, by stock.

Adult Return Monitoring and Run Assessment

Spring Chinook salmon began returning to the mouth of the Columbia River during January 2013. Federal, state, and Tribal fishery management agencies began participating in weekly coordination meetings, starting in April, to review the progress and status of the spring Chinook salmon run as the adults migrated upstream through the Lower Columbia and Snake rivers, crossed Lower Granite Reservoir, and entered into terminal fisheries and hatcheries. Information on run strength and timing was used to help managers anticipate meeting broodstock needs and manage sport and Tribal harvest.

As the run developed over time, it became apparent that the total return estimated for the Snake River, and subsequently for the Clearwater River, was going to be much lower than previous years. Agency managers expressed concern over meeting hatchery broodstock needs, but agreed to open a very restricted and limited sport and Tribal harvest season in the Clearwater River. Plans were initiated for hatcheries to open adult collection facilities early and be ready to collect additional broodstock to backfill other programs that might be short.

Dworshak NFH Return

The total number of BY2013 adult spring Chinook salmon collected at Dworshak NFH was 2,207 from ladder operations and 438 from broodstock supplementation efforts by angling sportsmen.

Ladder Operations - The adult ladder at Dworshak NFH was opened on June 17 and was operated continuously through September 17. Periodically, adults were moved from the adult collection pond to the spawning room where they were checked for tags, measured for length, and transferred to the adult holding ponds to mature for spawning. Nine inventories were conducted from July 9 through September 17. **Table 5** lists the numbers of adult spring Chinook inventoried on each date. Two thousand two hundred and seven (2,207) adults entered the rack at Dworshak NFH in 2013. The final disposition of all the adults is listed in the 2013 spring Chinook salmon spawning Report (Dworshak National Fish Hatchery 2014).

Table 5. Dates and number of adult BY2013 spring Chinook salmon trapped and inventoried at Dworshak NFH (Dworshak National Fish Hatchery 2013).

Date	Number of Fish in Ladder	Number of Fish Angled
9 July	365	
23 July	280	
5 August	279	397
13 August	405	41
20 August	454[1]	
27 August	162	
3 September	158	
10 September	45	
17 September	43	
Trap Morts	16	
Total	**2,207**	**438**

[1] The inventory on this day included seventy-three fish that were angled.

Broodstock Supplementation – A coordinated effort between the Complex and the Idaho Department of Fish and Game was made to supplement the collection of broodstock at Dworshak NFH using volunteer fishermen to catch adults in the North Fork Clearwater River near the face of Dworshak Dam. A total of 574 adults were collected, 204 1-Ocean males and 370 2 and 3-Ocean males and females. Sixty-three of the 1-Ocean males were released. Seventy-three were inadvertently put into holding pond 9 and were inventoried as if they had come into the ladder. Thus, only 438 are recorded as angled fish added to broodstock.

Stock Composition –Adults entering the ladder at Dworshak NFH are not all Dworshak NFH stock, but include strays from other federal, state and Tribal spring Chinook salmon production programs in the Clearwater River Basin, as well as occasional strays from programs outside the basin. The origin and approximate contribution of other stocks to the rack is determined by analysis of the coded-wire tags that are recovered from adults that are spawned. We recovered a total of 691 coded-wire tags during spawning, representing seven different stocks or programs. **Table 6** lists the agency, stock origin, the release site, the number of tags recovered, the expanded number of adults represented by those tags based on the tagging rate, the total estimated rack return, and the percent stock composition.

Based on CWTs, the expanded number of adults was 2,280, 365 fish less than the actual rack return of 2,645. Since the mark rates for the Crooked Creek, Lolo Creek, Johnson Creek, South Fork Salmon River, and the blank wire releases from the Nez Perce Tribal Hatchery were nearly 100%, they represent only themselves and not any adults without coded wire tags, assuming no tag loss. So, the 365 fish difference was added to the rest of the release groups by re-computing the percent composition of only these stocks and dividing the 365 fish among them accordingly. The final Rack Return and the percent composition for each stock is listed in **Table 6**.

Table 6. Stock composition of the adults that returned to Dworshak NFH in 2013, estimated using expanded coded-wire tag recovery information.

Agency	Stock Origin	Release Site	Number of Tags Recovered	Expanded Number of Adults	Rack Return	Stock Comp. %
USFWS	Dworshak NFH	NF Clearwater R.	156	1,299	1,520	57.5
USFWS	Kooskia NFH	Clear Cr.	14	89	104	3.9
IDF&G	Clearwater SFH	Clear Cr.	135	298	349	13.2
IDF&G	Clearwater SFH	Crooked Cr.	65	66	66	2.5
IDF&G	Clearwater SFH	Selway R.	124	213	249	9.4
IDF&G	Clearwater SFH	Red R.	8	76	89	3.4
IDF&G	Clearwater SFH	Powell	16	54	63	2.4
IDF&G	McCall SFH	South Fk. Salmon R.	2	2	2	0.1
IDF&G	Sawtooth SFH	Upper Salmon R.	3	11	13	0.5
Nez Perce Tribe	NPTH	Clearwater R.	101	104	122	4.6
Nez Perce Tribe	NPTH	Lolo Cr.	1	1	1	0.0
Nez Perce Tribe	McCall SFH	Johnson Cr.	5	5	5	0.2
Nez Perce Tribe	Clearwater SFH	NPTH	61	62	62	2.3
	Total		**691**	**2,280**	**2,645**	

Age Composition – Estimating age composition of Dworshak NFH origin adults is complicated because of the mixed stock composition in the rack return. The statistical procedures for estimating age composition used by the Idaho Department of Fish and Game (Cassinelli *et al.* 2012) would potentially introduce bias since the program does not account for mixed stocks in the analysis. To eliminate potential bias, we used only the CWTs from Dworshak NFH reared adults that returned to Dworshak NFH for the analysis. Length separation between 1-Ocean and 2-Ocean age classes and between the 2-Ocean and 3-Ocean age classes was accomplished by taking the mid-point of the overlap in lengths between the groups.

For males, examination of the length data revealed no substantial overlap in lengths between 1-Ocean adults with the division occurring between 620 and 640 mm. One 1-Ocean male was measured at 690 mm, and would have been classified as a 2-Ocean fish based on length. The overlap between 2-Ocean and 3-Ocean males was more substantial. The mid-point between the two age classes occurred between 870 and 880 mm. Based on this determination, there were two 2-Ocean males that were larger than 880 mm and would have been classified as 3-Ocean adults based on length. There was one 3-Ocean male that was 800 mm and would have been classified as a 2-Ocean adult.

For females, there was one 1-Ocean female measuring 610 mm. There was one 2-Ocean female that would have been classified as a 1-Ocean female based on length. There was little overlap between 2-Ocean and 3-Ocean females, with the division occurring between 820 and 830 mm. Based on this analysis there were two 3-Ocean females that would have been identified as 2-Ocean females. For BY2013, the age/length relationships for males and females are presented below.

	Males	**Females**
1-Ocean	≤ 629 mm	≤ 629
2-Ocean	630 to 879 mm	630 to 829 mm
3-Ocean	≥ 880mm	≥ 830 mm

Application of the age/length classifications would not result in substantial misidentification of fish age using length criteria. The only management implication would be spawning 1-Ocean males that might be classified as 2-Ocean males, potentially increasing the percent of 1-Ocean males in the spawning population above the desired level. However, since there was only one 1-Ocean male that was large enough to be misidentified as a 2-Ocean male, the effect would be minimal.

The age class, number, the length range (mm), average length, and the percent composition for male and female coded-wire tagged adults collected during spawning is reported in **Table 7**.

Table 7. Average length and percent composition of Dworshak NFH male and female adults in the 2013 rack returns at Dworshak NFH based on known age analysis using code-wire tags.

	Males				Females			
Age Class	Number of Tags	Length Range (mm)	Average Length (mm)	Percent Composition	Number of Tags	Length Range (mm)	Average Length (mm)	Percent Composition
1-Ocean	39	430-690	531	42%	1	610	610	2%
2-Ocean	50	640-880	743	54%	50	550-820	734	79%
3-Ocean	4	800-980	903	4%	12	770-950	853	19%

Male to Female Ratio

The male to female ratio was estimated using the numbers of coded-wire tags collected. A total of 156 coded-wire tagged Dworshak NFH origin adults of known sex were collected in the rack at Dworshak NFH. Of these, a total of 93 were males (including 1-Ocean fish) and 63 were females, providing an estimated male to female ratio of 1:0.7.

Kooskia NFH Rack Return

Adult Trap Operations – The goal for broodstock collection at Kooskia NFH is 800 adults, including 1-Ocean males (jacks). The weir on Clear Creek was put into operation in February 2013 and the adult trap was opened the on the 15nd of May 2013. The trap was operated intermittently from week to week in order to provide opportunities for harvest while insuring that sufficient broodstock were collected for the production program. The trap was finally closed on July 30, 2013. Nine inventories were conducted from May 22 through July 24. A total of 1,170 fish were collected, 1,144 hatchery origin adults and 26 natural adults. All adults were measured for length and checked for marks and tags. Nine hundred and forty-five adults were transported to Dworshak NFH for holding until mature for spawning. One hundred and fifteen adults were passed above the weir to spawn naturally (26 naturals as part of the ISS project and 89 unclipped fish with coded-wire tags as part of a US v Oregon agreement). Forty nine fish were provided to the Nez Perce Tribe for ceremonial and subsistence use and 57 fish were provided to the local Kooskia food bank. **Table 8** lists the numbers of fish inventoried on each date. The final disposition of all the adults is listed in the 2013 spring Chinook salmon Spawning Report (Dworshak National Fish Hatchery 2014).

Table 8. Dates and number of adult BY2013 SCS trapped and inventoried at Kooskia NFH (Idaho FRO data files).

Date	Hatchery Fish	Natural Fish	Total Number
22 May	6	0	6
29 May	87	3	90
11 June	295	9	304
14 June	226	8	234
20 June	336	5	341
27 June	79	0	79
15 July	81	1	82
19 July	20	0	20
24 July	14	0	14
Total	**1,144**	**26**	**1,170**

Stock Composition – Adults entering the trap at Kooskia NFH are not all Kooskia NFH stock, but include strays from other federal, state and Tribal spring Chinook salmon production programs in the Clearwater River Basin, as well as occasional strays from programs outside the basin. The origin and approximate contribution of other stocks to the rack is determined by analysis of the coded-wire tags that are recovered from adults that are spawned. We recovered a total of 162 coded-wire tags during spawning, representing six different spring Chinook salmon stocks or programs. **Table 9** lists the stock origin, the release site, the number of tags recovered, the expanded number of adults represented by those tags, the total estimated rack return, and the percent stock composition.

The expanded number of adults, based on coded-wire tags, was 263 fish lower than the actual rack return. The under-estimate of 263 was added proportionately from the four major contributing stocks: Kooskia NFH, Dworshak NFH released in the NF Clearwater, and IDF&G released in Clear Creek and Selway River.

Table 9. Stock composition of the adults that returned to Kooskia NFH in 2013, estimated using expanded coded-wire tag recovery information.

Stock Origin	Release Site	Number of Tags Recovered	Expanded Number of Adults	Estimated Rack Return	Stock Comp. %
Kooskia NFH	Clear Creek	118	757	978	83.6
Dworshak NFH	NF Clearwater River	11	80	103	8.8
IDF&G	Clear Creek	24	58	75	6.4
IDF&G	Selway River	3	6	8	0.7
IDF&G	Crooked River	2	2	2	0.2
Nez Perce Tribe	NPTH	4	4	4	0.3
Total		**162**	**907**	**1,170**	**100.0**

Age Composition – Estimating age composition of Kooskia NFH origin adults is complicated because of the mixed stock composition in the rack return (**Table 10**). The statistical procedures for estimating age composition used by the Idaho Department of Fish and Game (Cassinelli *et al.* 2012) would potentially introduce bias since the program does not account for mixed stocks in the analysis. To eliminate potential bias, we used only the coded-wire tags for Kooskia NFH origin adults that returned to Kooskia NFH for the analysis. Length separation between 1-Ocean and 2-Ocean age classes and between the 2-Ocean and 3-Ocean age classes for fish without

CWTs was accomplished by taking the mid-point of the overlap in lengths between the CWT groups.

For males, there was no overlap between 1-Ocean and 2-Ocean. The division between the 2-Ocean and 3-Ocean age groups occurred between 810-820 mm. There were two 3-Ocean males that would have been designated as 2-Ocean fish based on length criteria.

For females, there were no 1-Ocean individuals. The overlap between 2-Ocean and 3-Ocean females occurred at 790-800 mm, where there was one 3-Ocean female that was 700mm, and would have been classified as a 2-Ocean female. Based on examination of the data, length at age designations were assigned as follows:

	Males	**Females**
1-Ocean	< 610 mm	NA
2-Ocean	610 to 819 mm	< 800 mm
3-Ocean	≥ 820mm	≥ 800 mm

The age class, number, the length range (mm), average length, and the percent composition for male and female coded-wire tagged adults collected during spawning is reported in **Table 10**.

Table 10. Average length and percent composition of Kooskia NFH male and female adults in the 2013 rack return based on known age analysis using code-wire tags.

	Males				Females			
Age Class	Number of Tags	Length Range (mm)	Average Length (mm)	Percent Composition	Number of Tags	Length Range (mm)	Average Length (mm)	Percent Composition[1]
1-Ocean	11	470-690	529	21%	0	-		-
2-Ocean	41	610-810	722	77%	62	650-790	719	95%
3-Ocean	1	850	850	2%	3	700-900	816	5%

Male to Female Ratio

The male to female ratio was estimated using the numbers of coded-wire tags collected. A total of 118 coded-wire tagged Kooskia NFH origin adults of known sex were collected in the racks at Dworshak and Kooskia NFHs. A total of 53 were males (including 1-Ocean fish) and 65 were females, providing an estimated male to female ratio of 1:1.2.

Sport Harvest

Estimates of the numbers of adults and jacks harvested in the sport fishery for Dworshak and Kooskia NFH origin spring Chinook salmon are based on expanded numbers of coded-wire tags collected during sport fish harvest surveys by the IDFG. These tags are expanded by tagging and sample rates, across multiple creel survey river sections (Cassinelli, IDFG personal communication). The total estimated harvest of Dworshak NFH stock in the Clearwater River in 2013 was 332; 229 1-Ocean males and 103 2-Ocean males and females. The total estimated harvest of Kooskia NFH stock in the Clearwater River in 2013 was 508; 368 1-Ocean males and

140 2-Ocean males and females. No 3-Ocean adults from Dworshak or Kooskia NFHs were recorded as harvested in the sport fishery in 2013.

Tribal Harvest

The Nez Perce Tribe provides estimates of Tribal harvest, most of which occurs at the ladder at Dworshak NFH in the North Fork Clearwater River and in Clear Creek below the adult trap at Kooskia NFH, on the Middle Fork of the Clearwater River (U.S. Fish and Wildlife Service *et al*. 2013). The total estimated 2013 harvest of Dworshak NFH stock in the North Fork was 635 hatchery fish which included 250 1-Ocean fish, or Jacks. The total estimated 2013 harvest of Kooskia NFH stock in Clear Creek was 191 hatchery fish which included 41 1-Ocean fish. These are minimum harvest estimates and do not include the contribution that other Tribal harvests in the Clearwater River would make to the totals. The Tribe does not provide age composition estimates of the harvested adults (2- and 3-Ocean adults). Those numbers are estimated using the percentages of 2-, and 3-Ocean adults returning to the respective racks, making the assumption that harvest occurred in proportion to the rack returns. The age composition of Tribal harvests prior to 2013 is reported in Tables 8 and 10 in Idaho Fishery Resource Office (2012). For 2013, we estimated the 2- and 3-Ocean contribution in the Tribal harvests according to the proportion of coded-wire tagged 2- and 3-Ocean adults (males and females combined) in **Table 7** for the North Fork Clearwater River and in **Table 10** for Clear Creek. Harvest in the North Fork was estimated to include 331 2-Ocean and 54 3-Ocean adults. In Clear Creek, we estimate the Tribal harvest to include 138 2-Ocean and 12 3-Ocean adults.

Total Estimated Adult Returns to the Clearwater River

The numbers of Dworshak and Kooskia NFH origin adult spring Chinook salmon that returned to the Clearwater River in 2013 are challenging to determine because of the mixed stock fisheries and harvests that occur in the Clearwater River basin. The adults that entered the Clearwater River in 2013 originated from smolt releases at Dworshak NFH, Kooskia NFH, Idaho Department of Fish and Game (IDFG) facilities at Powell, Red River, and Crooked River, and Nez Perce Tribal Hatchery releases into Lolo Creek, Newsome Creek, and the Selway River in 2010, 2011, and 2012. The estimated returns of adults for the Dworshak and Kooskia NFH stocks were based on the development of expansion factors derived from the ratio of PIT-tagged to un-PIT tagged adults detected at Lower Granite Dam and the hatchery racks (Peery *et al.* 2012). It is understood that PIT tag expansions in adult returns are likely biased low due to possible tag loss and/or differential mortality during the period from time of release to time of adult return. The Idaho FRO is currently working cooperatively with the IDFG in analyzing the degree of any possible bias in hopes of being able to correct these expansions in the future.

Dworshak NFH Total Return – For 2013, the total estimated return to Lower Granite Dam based on expanded numbers of PIT tagged adults detected at Lower Granite Dam was 4,719 (**Table 11**). The 95% CI was 3,551 to 7,255 calculated using 1000 bootstrap iterations. The estimate is a summary of the separate estimates made for each age class: 1-Ocean (Jacks) = 1,548; 2-Ocean = 2,763; 3-Ocean = 448.

Kooskia NFH Total Return – For 2013, the total estimated return to Lower Granite Dam was estimated to be 2,214 (**Table 12**). The 95% CI was 1,614 to 3,591 calculated using 1000 bootstrap iterations. The estimate is a summary of the separate estimates made for each age class: 1-Ocean (Jacks) = 251; 2-Ocean = 1,772; 3-Ocean = 191.

Escapements - Using the estimated total return to Lower Granite Dam and subtracting the harvest and the rack return, the escapement of Dworshak NFH stock (those fish not returning to a rack or harvested in a fishery) was estimated to be 2,272 (**Table 11**). Escapement for Kooskia NFH was estimated to be 477 (**Table 12**).

Table 11. Adult returns of Dworshak NFH adult spring Chinook salmon to the Clearwater River from 2008-2013.

Return Year	Rack Return	Sport Harvest	Tribal Harvest	Escapement	Total Run[1]
2008	1,857	1,109	159[2]	na	3,125
2009	2,171	1,373	354	848	4,746
2010	1,225	1,476	1,077[3]	282	4,060
2011	1,250	2,381	943	4,091	8,665
2012	1,322	2,068	871	5,792	10,053
Mean	**1,565**	**1,681**	**681**	**2,753**	**6,130**
2013	1,520	332	635	2,272	4,759

[1] Total Run for 2007 and 2008 does not include escapement.
[2] Total number based on angler interview and is not an expanded estimate.
[3] Includes 17 jacks.

Table 11 in Idaho Fishery Resource Office (2012) provides a historical summary of the number of Dworshak NFH stock adults returning to the rack, harvested in the sport and Tribal fisheries, and the estimated number in the escapement broken down by ocean age class for return years 1984 to 2007.

Table 12. Adult returns of Kooskia NFH adult spring Chinook salmon to the Clearwater River from 2008-2013.

Return Year	Rack Return	Sport Harvest	Tribal Harvest	Escapement	Total Run[1]
2008	816	623	132[2]	na	1,571
2009	590	188	123	na	901
2010	807	1,327	1,156[3]	489	3,928
2011	1,255	1,645	308	3,611	6,819
2012	858	627	471	7,003	8,721
Mean	**865**	**822**	**438**	**3,701**	**4,388**
2013	1,170	508	191	345	2,214

[1] Does not include escapement for total returns from 2008 to 2009.
[2] Actual harvest estimate not reported. Idaho FRO estimate based on the average harvest reported for 2005, 2006, 2007, and 2009.
[3] Includes 12 Jacks.

Table 12 in Idaho Fishery Resources (2012) provides a historical summary of the number of Kooskia NFH stock adults returning to the rack, harvested in the sport and Tribal fisheries, and the estimated number in the escapement broken down by ocean age class for return years 1984 to 2011.

Adult PIT Tag Returns

The conversion rate of Dworshak and Kooskia spring Chinook was calculated using Columbia River Data Access in Real Time software (Columbia Basin Research, available at www.cbr.edu/dart/dart.html). The conversion rate from Lower Granite Dam to the Dworshak adult ladder was calculated using the number of interrogations at Dworshak NFH adult ladder divided by the interrogations at Lower Granite Dam.

During the 2013 migration, a total of 178 PIT tagged adults were detected at Bonneville Dam. Of those, 137 were detected at Lower Granite Dam, giving a conversion rate of 0.77 from Bonneville Dam to Lower Granite Dam. The PIT tagged adults detected at LGD consisted of 71 1-Ocean fish (BY10 released in 2012), 55 2-Ocean fish (BY09 released in 2011) and 11 3-Ocean fish (BY08 released in 2010). Fifty-nine of those were collected in the Dworshak NFH adult ladder giving a conversion rate from LGD to Dworshak NFH of 0.43. The first detection date for Dworshak origin spring Chinook salmon at Lower Granite Dam was April 12, 2013. The last detection was on June 7, 2013. Mean travel time for adults from Bonneville Dam to Lower Granite Dam was 12 days.

During 2013, 54 Kooskia NFH origin PIT tagged adult spring Chinook salmon were detected at Bonneville Dam. Of those, 43 were interrogated at Lower Granite Dam (3 from BY08, 27from BY09, and 13 from BY10). The first detection date for Kooskia origin spring Chinook at Lower Granite Dam was May 3, 2013. The last detection was on June 13, 2013. The conversion rate of Kooskia spring Chinook from Bonneville Dam to Lower Granite Dam was 0.80.

BROOD YEAR 2008 SMOLT TO ADULT RETURN RATE (SAR)

The smolt-to-adult-return-rate, or SAR, is the ratio of the number of smolts that are released divided by the number of adults that return from that release. The SAR is one of the metrics to measure production performance in the LSRCP program. With the return of the 3-Ocean adults in 2013, estimating the SAR for Brood Year 2008 can be completed. The smolts were released in 2010, the 1-Ocean adults returned in 2011, 2-Ocean adults returned in 2012, and 3-Ocean adults returned in 2013, completing the adult returns for that brood year.

Dworshak NFH

Table 13 lists the numbers of Dworshak NFH spring Chinook salmon of each age class for the estimated total return to Lower Granite Dam, for the hatchery rack, the sport fishery, the Tribal fishery, and estimated escapement for 2013. We used the age composition percentage (males and females combined) of the rack return to estimate the age composition of the escapement. By subtracting the hatchery rack, the sport harvest, and the Tribal harvest in each age class from the estimated total return of each age class, the escapement was estimated to be 680 1-Oceans, 1, 355 2-Oceans, and 237 3-Oceans for a total of 2,272.

Table 13. The estimated number of Dworshak NFH spring Chinook salmon adults of each ocean age class in the various fishery programs in the Clearwater River for the 2013 adult return, males and females combined.

Program	1-Ocean BY10	2-Ocean BY09	3-Ocean BY08	Total
Hatchery Rack	389	974	157	1,520
Sport Harvest	229	103	0	332
Tribal Harvest	250	331	54	635
Escapement	680	1,355	237	2,272
Total	**1,548**	**2,763**	**448**	**4,759**

Table 14 lists the numbers of smolts released, and numbers and percent survival of adults returning by age class for Brood Years 2005 through 2010 (release years 2007 to 2012). These include the rack return, the harvest estimates from the sport and Tribal fisheries, and estimates of escapement. The historical numbers, from Brood Years 1981 to 2009 (release years 1983 to 2011) are listed in Idaho Fisheries Resource Office (2012). Estimated smolt-to-adult-return, or survival, for Brood Year 2008, released as smolts in 2010, was 0.0113.

Kooskia NFH

Table 15 lists the numbers of Kooskia NFH spring Chinook salmon of each age class in the hatchery rack, the sport fishery, the Tribal fishery, and estimated escapement during 2013. The Idaho Department of Fish and Game reported a total harvest of 508 Kooskia NFH stock spring Chinook salmon. The Nez Perce Tribe reported a total of 191 fish of Kooskia NFH stock harvested in the Tribal fishery in Clear Creek. The percent of 2- and 3-Ocean adults in the Kooskia NFH rack (1-Ocean adults excluded) was 85% and 7.5%, respectively. These percentages were applied to the Tribe's harvest total to estimate the 2- and 3-Ocean age classes in the Tribal harvest. We used the age composition percentage (males and females combined) of the rack return to estimate the age composition of the escapement.

Table 16 lists the numbers of smolts released and the estimated survival of each returning age class for Brood Years 2005 to 2010 (Release Years 2007 to 2012). These include harvest estimates from the sport and Tribal fisheries and escapement estimates for the last two return years. The historical numbers, for Brood Years 1971 to 2011, are listed in Idaho Fisheries Resource Office (2012). Estimated smolt-to-adult-return, or survival, for Brood Year 2008, released as smolts in 2010, was 0.0136.

Table 14. Brood Year, release year, number of smolts released, and the numbers and percent survival of Dworshak NFH adult returns to the Clearwater River by age class for Brood Years 2005 to 2010. Estimates include the rack return, the sport and Tribal harvest numbers and estimates of escapement, starting with returns in 2009 (BYs 2005,2006, and 2007).

			1-Ocean Returns			2-Ocean Returns			3-Ocean Returns				
Brood Year	Release Year	Smolts Released	Return Year	Number	SAR	Return Year	Number	SAR	Return Year	Number	SAR	Total Return	SAR
2005	2007	963,211	2008	506	0.00053	2009	2516	0.00261	2010	857	0.00089	3,879	0.00403
2006	2008	939,000	2009	1,847	0.00197	2010	5666	0.00603	2011	983	0.00104	8,496	0.00904
2007	2009	1,014,748	2010	427	0.00042	2011	3,281	0.00323	2012	2,024	0.00199	5,732	0.00564
2008	2010	1,109,195	2011	4,401	0.00397	2012	7,724	0.00696	2013	448	0.00040	12,573	0.0113
2009	2011	1,078,250	2012	305	0.00028	2013	2,763	0.00256					
2010	2012	1,044,080	2013	1,548	0.00148								

[1] Releases at hatchery only and does not include off-site releases or fry/fingerling releases.

Table 15. The estimated number of Kooskia NFH spring Chinook salmon adults of each ocean age class in the various fishery programs in the Clearwater River for the 2013 adult return, males and females combined.

Program	**I-Ocean BY10**	**II-Ocean BY09**	**III-Ocean BY08**	**Total**
Hatchery Rack	109	1,021	40	1,170
Sport Harvest	368	140	0	508
Tribal Harvest	41	138	12	191
Escapement	32	301	12	345
Total	**550**	**1,600**	**64**	**2,214**

Table 16. Brood Year, release year, number of smolts released, and the numbers and percent survival of adult returns to the Clearwater River by age class for Brood Years 2005 to 2009, Kooskia NFH stock. Estimates include the rack return, the sport and Tribal harvest numbers and estimates of escapement, starting with returns in 2009 (BYs 05, 06, and 07).

			1-Ocean Returns			2-Ocean Returns			3-Ocean Returns				
Brood Year	Release Year	Smolts Released	Return Year	Number	SAR	Return Year	Number	SAR	Return Year	Number	SAR	Total Return	SAR
2005	2007	569,565	2008	181	0.00032	2009	573	0.00101	2010	231	0.00041	985	0.00173
2006	2008	649,601	2009	246	0.00038	2010	3435	0.00529	2011	276	0.0004	3,208	0.0017
2007	2009	603,679	2010	262	0.00043	2011	1,583	0.0026	2012	1,307	0.2165	8,721	0.0144
2008	2010	632,330	2011	1,349	0.00210	2012	7,166	1.1333	2013	64	0.0001	8,579	0.0136
2009	2011	657,267	2012	248	0.00040	2013	1,600	0.0024					
2010	2012	619,865	2013	550	0.00089								

PREDICTION FOR 2013 ADULT RETURNS

Review of 2013 Predictions

Dworshak NFH - The total number of spring Chinook salmon that we predicted would return to Dworshak NFH and associated fisheries in 2013 was 5,588 (U.S. Fish and Wildlife Service *et al.* 2013). The number of Dworshak NFH Chinook salmon estimated to have returned to the Clearwater River was 4,759 (**Table 16**). The greatest disparity was in the number of 2-, and 3-Ocean fish returning. The 2-Oceans were over-estimated by nearly 1,846 fish while the 3-Oceans were under-estimated by 448. **Table 17** lists the predicted returns and the expanded actual returns of all three age classes of adults in 2013.

Table 17. Predicted and calculated returns of Dworshak NFH spring Chinook salmon by ocean age class, 2013, which includes sport and tribal harvest estimates and an estimate of escapement.

Ocean Age Class	Prediction	Total Return
1-Ocean	979	1,538
2-Ocean	4,609	2,763
3-Ocean	0	448
Total	5,588	4,759

Kooskia NFH – The total number of spring Chinook salmon that we predicted would return to Kooskia NFH and associated fisheries in 2013 was 6,541 (U.S. Fish and Wildlife Service *et al.* 2013). The number that returned in 2013 was estimated to be 2,214. The Kooskia NFH stock returned at a much lower rate than was predicted. **Table 18** lists the predicted and the estimated actual returns of all three age classes of adults in 2013. Predictions were higher than the actual estimated return with the major difference occurring in the 2-Ocean returns. Predictions are used for preliminary management purposes such as potential harvest, brood stock collection adequacy, and planning for adult out-planting. We will continue to work to improve prediction methods.

Table 18. Predicted and calculated returns of Kooskia NFH spring Chinook salmon to the Clearwater River for 2013 by ocean age class.

Ocean Age Class	Prediction	Total Return
1-Ocean	549	550
2-Ocean	5,992	1,600
3-Ocean	0	64
Total	6,541	2,214

2014 Run Predictions

Our forecast for the 2014 spring Chinook salmon return to the Clearwater River for the Dworshak and Kooskia NFH stocks is given in **Table 19** (U.S. Fish and Wildlife Service *et al.* 2014). Brood stock requirements are 1,200 adults at Dworshak NFH and 800 for Kooskia NFH. If the prediction is at all close, the Idaho Department of Fish and Game and the Nez Perce Tribe will have the opportunity to open sport and tribal fisheries in the Clearwater River in the spring of 2014. However, decisions on harvest management will be made only after dam counts of PIT tagged adults provide actual estimates of returning adults in the late spring of 2014.

Table 19. Predicted returns of spring Chinook salmon to the Clearwater River at Lower Granite Dam from the Dworshak Fishery Complex by ocean age class, 2014.

Ocean Age Class	Dworshak NFH	Kooskia NFH
1-Ocean	634	788
2-Ocean	5,074	2,908
3-Ocean	1,214	587
Total	6,922	4,283

REFERENCES

Bowles, E. and E. Leitzinger. 1991. Salmon Supplementation Studies in Idaho Rivers (ISS). Experimental design. Idaho Dept. of Fish and Game. Prepared for the U.S. Department of Energy, Bonneville Power Administration, Portland, Oregon.

Columbia River Data Access in Real Time. 2011. Available: www.cbr.washing.edu/dart/dart.html

Dworshak Complex Hatchery Evaluation Team. 2011. Increasing production of spring Chinook salmon at Dworshak National Fish Hatchery, An assessment and proposal. Report to the Dworshak National Fish Hatchery Co-Managers, Dworshak Fishery Complex, U.S. Fish and Wildlife Service, Orofino, Idaho. 10 pp.

Dworshak National Fish Hatchery. 2010. Spawning Report, Brood Year 2010 Spring Chinook Salmon. Annual report by the Dworshak National Fish Hatchery, Dworshak Fisheries Complex, U.S. Fish and Wildlife Service, Ahsahka, Idaho. 8 pp.

Dworshak National Fish Hatchery. 2011. Spawning Report, Brood Year 2012 Spring Chinook Salmon. Annual report by the Dworshak National Fish Hatchery, Dworshak Fisheries Complex, U.S. Fish and Wildlife Service, Ahsahka, Idaho. 8 pp.

Dworshak National Fish Hatchery. 2012. Spawning Report, Brood Year 2011 Spring Chinook Salmon. Annual report by the Dworshak National Fish Hatchery, Dworshak Fisheries Complex, U.S. Fish and Wildlife Service, Ahsahka, Idaho. 8 pp.

Elliot, D.G. and R. J. Pascho. 1994. Juvenile fish transportation: Impact of bacterial kidney disease on survival of spring/summer Chinook salmon stocks. Annual Report. U.S. Army Corps of Engineers. Contract E86920048. 79p.

Idaho Fishery Resource Office. 2012. An historical record of the adult spring Chinook salmon returns to Dworshak and Kooskia National Fish Hatcheries, through 2011. Technical fisheries report by the Idaho Fishery Resource Office, Dworshak Fisheries Complex, U.S. Fish and Wildlife Service, Orofino, ID. 28 pp.

Jones, R.N. and W.H. Miller. 1996. An evaluation of rearing density in relation to post-release smolt survival and adult returns of spring Chinook salmon at Dworshak National Fish Hatchery. Idaho Fishery Resource Office, U.S. Fish and Wildlife Service, Ahsahka, Idaho. 37 p.

Lady, J. Westhagen P., and Skalski, J.R. 2001. SURPH 2.2b User's Manual. University of Washington, Seattle, Washington. 8pp. Dworkshak National Fish Hatchery. 2007. Spawning Report, Brood Year 2007 Spring Chinook Salmon. Annual report by the Dworshak National Fish Hatchery, Dworshak Fisheries Complex, U.S. Fish and Wildlife Service, Ahsahka, Idaho. 8pp.

U.S. Fish and Wildlife Service, Idaho Department of Fish and Game, and Nez Perce Tribe Fisheries. 2012. 2012 AOP Final Release Tables, 2012 Annual Operating Plan for Fish Production Programs in the Clearwater River Basin. 42 pp.

U.S. Fish and Wildlife Service, Idaho Department of Fish and Game, and Nez Perce Tribe Fisheries. 2013. 2013 AOP Final Release Tables, 2013 Annual Operating Plan for Fish Production Programs in the Clearwater River Basin, 2013 AOP Projected Release and Marking Tables, April 3, 2013.

U.S. Fish and Wildlife Service, Idaho Department of Fish and Game, and Nez Perce Tribe Fisheries. 2014. 2014 AOP Final Release Tables, 2014 Annual Operating Plan for Fish Production Programs in the Clearwater River Basin, 2014 AOP Projected Release and Marking Tables, January 28, 2014.